Cannabis Demand and Use among Veterans: A Prospective Examination

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Introduction and Objectives

➢ Cannabis demand (i.e., relative value), assessed cross-sectionally via a hypothetical marijuana purchase task (MPT), has been associated with cannabis use, problems, and dependence symptoms, among others.

➢ However, neither the prospective stability of the MPT, nor the cyclical relationship between demand and use over time has been investigated. Moreover, behavioral economic research among veterans is extremely limited.

➢ **This study assessed stability and change in cannabis demand over six months using two waves of data from a veteran sample reporting past 6-month cannabis use. Autoregressive cross-lagged panel models assessed the longitudinal associations between demand (i.e., intensity, O_{max}, P_{max}, breakpoint) and use.**

Methods

➢ **Participants (n = 133):**
  • Recently returned combat veterans from Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn (OEF/OIF/OND)

➢ **Inclusion Criteria:**
  • Past 180-day cannabis use at baseline or 6-months

➢ **Procedure:**
  • Veterans were screened for eligibility by telephone
  • Potentially eligible participants completed an in-person screening session during which they provided informed consent and completed measures
  • Two additional sessions at 6 and 12 months (this study utilized data from baseline and 6-months)
  • Participants compensated $50 per visit

➢ **Measures:**
  • Demographics verified through VHA medical record
  • Timeline follow-back (TLFB) assessment for past 6-month cannabis and other substance use
  • Marijuana purchase task (MPT) to assess demand (i.e., relative value) for cannabis "hits"

➢ **Demand Index Generation:**
  • Intensity (consumption at zero cost), O_{max} (maximum expenditure), P_{max} (maximum price), breakpoint (price suppressing consumption to zero

➢ **Cross-Lagged Models:**
  • Prospective bidirectional relations between each cannabis demand index and cannabis use frequency were examined using cross-lagged panel models (CLPM) in Mplus version 8.2

Variable	n (%) or M (SD)
Age	31.09 (SD = 7.89)
Sex (%male)	125 (94%)
Ethnicity	
Hispanic/Latino	18 (13.5%)
Race	
American Indian/Alaska Native	1 (0.8%)
Asian	3 (2.3%)
Black or African American	7 (5.3%)
White or Caucasian	101 (75.9%)
Multiracial	7 (5.3%)
Other	12 (9%)
Unknown/Missing	2 (1.5%)
Annual Household Income	
$19,999 or less	28 (21.1%)
$20,000 – 39,999	47 (34.5%)
$40,000 – 59,999	29 (21.8%)
$60,000 or higher	29 (21.8%)
Cannabis Use Behavior	
Cannabis use at BL	115 (86.5%)
Cannabis use at 6M	113 (85.0%)
Cannabis use days BL	62.92 (SD = 72.49)
Cannabis use days 6M	66.71 (SD = 75.53)
Daily cannabis use BL	46 (34.6%)
Daily cannabis use 6M	41 (30.8%)
Other Substance Use	
Cigarette smokers at BL	72 (54.1%)
%Tobacco use days among smokers	81.99 (SD = 30.73)
Alcohol drinkers at BL	122 (91.7%)
%Alcohol use days among drinkers	51.65 (SD = 52.23)
Cannabis Demand BL	
Intensity	21.43 (SD = 33.20)
O_{max}	14.18 (SD = 26.23)
P_{max}	2.22 (SD = 3.15)
Breakpoint	3.17 (SD = 3.67)
Cannabis Demand 6M	
Intensity	21.94 (SD = 33.01)
O_{max}	19.63 (SD = 48.73)
P_{max}	1.84 (SD = 2.68)
Breakpoint	3.04 (SD = 3.59)

Table 1. Sample demographics, substance use, and demand.

Results

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	--												
2. Sex	-.011	--											
3. Race	-.016	-.033	--										
4. Income	.317**	-.132	-.194*	--									
5. BL Cannabis Days	-.052	.122	.205*	-.291**	--								
6. 6M Cannabis Days	-.084	-.028	.13	-.262**	.788**	--							
7. BL Intensity	-.113	.190*	.101	-.257**	.520**	.509**	--						
8. 6M Intensity	-.061	.001	.026	-.301**	.523**	.644**	.556**	--					
9. BL O_{max}	-.063	.099	-.073	-.13	.504**	.481**	.513**	.345**	--				
10. 6M O_{max}	.136	-.07	-.092	-.068	.483**	.538**	.312**	.671**	.408**	--			
11. BL Breakpoint	-.101	.082	-.108	-.106	.410**	.426**	.368**	.314**	.886**	.382**	--		
12. 6M Breakpoint	.189*	-.091	-.132	.03	.397**	.463**	.202*	.494**	.359**	.893**	.395**	--	
13. BL P_{max}	-.112	.039	-.087	-.06	.378**	.396**	.282**	.308**	.809**	.375**	.937**	.390**	--
14. 6M P_{max}	.233**	-.1	-.079	.072	.290**	.337**	.074	.364**	.288**	.829**	.319**	.923**	.301**

Table 2. Correlations among demographic variables, cannabis use, and observed demand indices at baseline and 6-months. *p < .05, **p < .01

	χ^2	df	CFI	RMSEA	BIC	AIC	$\Delta\chi^2$	Δdf	p
Models with Covariates[a]									
Intensity	226.31	7	0.97	.145	4218.42	4172.17	7.58	2	.023
Breakpoint	185.55	7	1.00	.000	3735.33	3689.08	1.38	2	.503
P_{max}	167.19	7	1.00	.000	3668.95	3622.70	1.68	2	.432
Models without Covariates									
Intensity	222.20	5	1.00	.000	4212.75	4172.29	0.00	0	.000
O_{max}	183.93	5	1.00	.000	3396.35	3355.88	0.00	0	.000
Breakpoint	173.97	5	1.00	.000	3737.13	3696.66	0.00	0	.000
P_{max}	154.14	5	1.00	.000	3672.22	3631.75	0.00	0	.000

Table 3. Model fit statistics with cannabis demand indices and cannabis use days with and without covariates. The full intensity model included income as a covariate, while models with breakpoint and P_{max} included age as a covariate. [a] Socio-demographic variables were not correlated with O_{max}; thus, this model was not conducted with covariates.
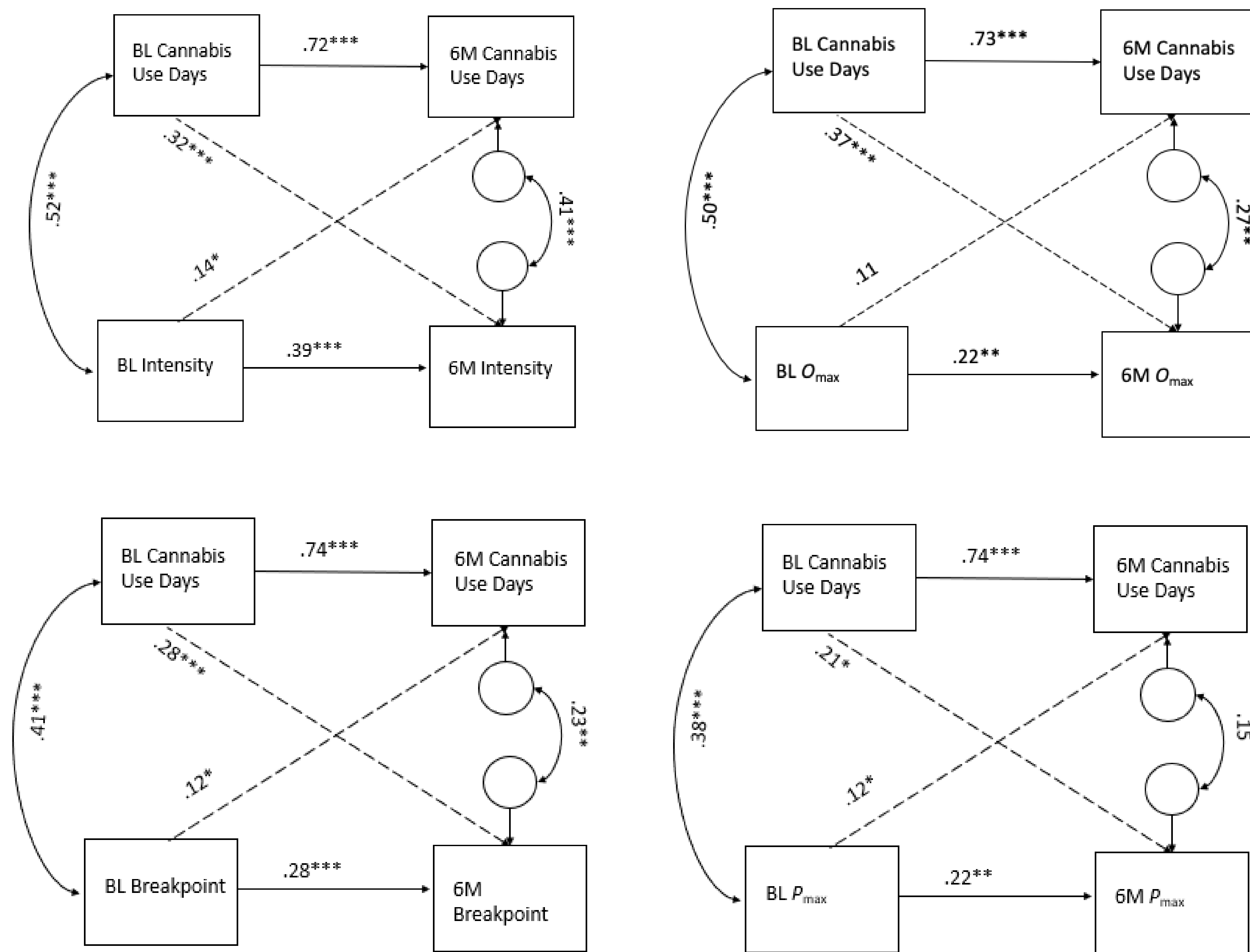
Cross-Lagged Panel Models

Figure 1. Cross-lagged panel math models displaying associations between cannabis use days and intensity, O_{max}, breakpoint, and P_{max}, across two time-points (baseline and 6-months). Curved arrows represent correlation between the variables. Solid straight arrows represent the autoregressive paths. Dashed diagonal lines represent the cross-lagged paths. Model estimates presented are without covariates.

Path	Intensity	O_{max}[a]	Breakpoint	P_{max}
Models without Covariates				
Autoregressive				
BL Cannabis use → 6M Cannabis	.72 (.05)***	.73 (.05)***	.74 (.04)***	.74 (.04)***
BL Demand → 6M Demand	.39 (.08)***	.22 (.08)**	.28 (.08)***	.22 (.09)**
Cross-lagged				
BL Cannabis use → 6M Demand	.32 (.08)***	.37 (.08)***	.28 (.08)***	.21 (.08)*
BL Demand → 6M Cannabis use	.14 (.06)*	.11 (.06)	.12 (.06)*	.12 (.06)*
Covariance				
BL Demand/Cannabis Use	.52 (.06)***	.50 (.07)***	.41 (.07)***	.38 (.07)***
6M Demand/Cannabis Use	.41 (.07)***	.27 (.08)**	.23 (.08)**	.15 (.09)
Models with Covariates				
Autoregressive				
BL Cannabis use → 6M Cannabis	.72 (.05)***	-	.74 (.04)***	.75 (.04)***
BL Demand → 6M Demand	.37 (.08)***	-	.30 (.08)***	.25 (.08)**
Cross-lagged				
BL Cannabis use → 6M Demand	.32 (.08)***	-	.28 (.08)***	.21 (.08)*
BL Demand → 6M Cannabis use	.14 (.06)*	-	.12 (.06)*	.12 (.06)†
Covariance				
BL Demand/Cannabis Use	.52 (.06)***	-	.41 (.07)***	.38 (.07)***
6M Demand/Cannabis Use	.41 (.07)***	-	.25 (.08)**	.18 (.08)*

Table 4. Standardized parameter estimates (standard errors) from cross-lagged panel models examining cannabis demand and cannabis use days in past 180-days. Substance use frequency is past 180 days. [a]Socio-demographic variables were not significantly correlated with O_{max}; thus, this model was not conducted with covariates. †p = .051, *p < .05, **p < .01, ***p < .001

Conclusions

➢ Cannabis demand indices demonstrated prospective stability over six months and varied along with natural changes in cannabis use.

➢ Importantly, intensity, P_{max}, and breakpoint displayed bidirectional predictive associations with cannabis use, and across indices, the prospective pathway from use to demand was consistently stronger.

➢ Findings highlight the value of assessing cannabis demand longitudinally, particularly among clinical samples, to determine how demand fluctuates in response to experimental manipulation, intervention, and treatment.

Conflict of Interest Statement: The authors report no conflict of interest in the performance or publication of this research. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health, the Department of Veterans Affairs, or the United States Government.

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